Spin Density Modulation Near the Vortex Cores of $Bi_2Sr_2CaCu_2O_{8+\delta}$

Andrew Mounce[1], Sangwon Oh[1], Sutirtha Mukhopadhyay[1], William Halperin[1], Arniel Reyes[2], Phillip Kuhns[2], Kazuhiro Fujita[3], Motoyuki Ishikado[3], Shin-Ichi Uchida[3]

[1]*Northwestern University, Evanton, IL, USA*
[2]*National High Magnetic Field Laboratory, Tallahassee, FL, USA*
[3]*University of Tokyo, Tokyo, Japan*

Spatially resolved NMR spin-lattice (T_1) and spin-spin (T_2) measurements are used to probe the microscopic structure of the vortex lattice in the highly anisotropic High Temperature Superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$. Results, differing from similar measurements in $YB_2Cu_3O_7$[1], are interpreted in the context of a long range spin density modulation in and outside the vortex core in accordance with previous LDOS "checkerboard" patterns found by STM[2]. Our model includes a checkerboard pattern of a Gaussian cosine decay from the vortex core, characterized by a amplitude and decay length, in addition to the diamagnetic contribution from vortices. Fitting this model to our data, we find that the amplitude increases and the decay length decreases with increasing external field and with this model we can also account for experimental T_1 relaxation rates. This work is supported by **DOE/BES: DE-FG02-05ER46248** and the NHMFL by NSF and the State of Florida.

[1] Mitrović, V.F. *et.al.* Nature **413**, 501(2001)

[2] Hoffman, J.E. *et al.* Science **295**, 466 (2002)